

SEVILLA



**IDA: ADVANCED
DOCTORAL RESEARCH
IN ARCHITECTURE**

Antonio Tejedor Cabrera, Marta Molina Huelva (comp.)

IDA: Advanced Doctoral Research in Architecture
Sevilla: Universidad de Sevilla, 2017.

1.408 pp. 21 x 29,7 cm

ISBN: 978-84-16784-99-8

All right reserved. No part of this book may be reproduced stored in a retrieval system, or transmitted, in any form or any means without prior written permission from the Publisher.

EDITOR

Universidad de Sevilla

COMPILERS

Antonio Tejedor Cabrera

Marta Molina Huelva

DESIGN AND LAYOUT BY

Pablo Blázquez Jesús

María Carrascal Pérez

Daniel Longa García

Marina López Sánchez

Francisco Javier Navarro de Pablos

Gabriel Velasco Blanco

ADMINISTRATION AND SERVICES STAFF

Adoración Gavira Iglesias

Seville, november 2017

© 2017. IDA: ADVANCED DOCTORAL RESEARCH IN ARCHITECTURE

SEVILLA

IDE

ORGANIZED BY

iuacc
INSTITUTO UNIVERSITARIO
ARQUITECTURA Y CIENCIAS DE LA CONSTRUCCIÓN

 **uidus**
Escuela Internacional de Doctorado

arquitectura
Escuela Técnica Superior
Universidad de Sevilla

COLLABORATORS



Consejo Andaluz
de Colegios Oficiales
de Arquitectos



fundación **arquia**

All manuscripts have been submitted to blind peer review, all content in this publication has been strictly selected, the international scientific committee that participates in the selection of the works is of international character and of recognized prestige, an scrupulous method of content filtering has been followed in terms of its veracity, scientific definition and plot quality.

COMMITTEES

CONFERENCE CHAIRPERSONS

Antonio Tejedor Cabrera, *Coordinator of the PhD Program in Architecture and Director of the University Institute of Architecture and Construction Sciences, Professor Department of Architectural Design, University of Seville*

Marta Molina Huelva, *Secretary of the University Institute of Architecture and Construction Sciences, Professor of the Department of Building Structures and Geotechnical Engineering, University of Seville*

ORGANISING COMMITTEE

María Carrascal Pérez, *Department of History, Theory and Architectural Composition, University of Seville*

Mercedes Linares Gómez del Pulgar, *Department of Architectural Graphic Expression, University of Seville*

Ángel Martínez García-Posada, *Department of Architectural Design, University of Seville*

Pilar Mercader Moyano, *Department of Architectural Constructions I, University of Seville*

Domingo Sánchez Fuentes, *Department of Urban Planning and Spatial Planning, University of Seville*

Manuel Vázquez Boza, *Department of Building Structures and Land Engineering, University of Seville*

CONFERENCE SECRETARY

Pablo Blázquez Jesús, *Ph.D. student, Department of Architectural Design, University of Seville*

Marina López Sánchez, *Ph.D. student, Department of Architectural Design, University of Seville*

SCIENTIFIC COMMITTEE

José Aguiar-Universidade de Lisboa
Benno Albrecht-Università IUAV di Venezia
Francisco Javier Alejandro Sánchez-Universidad de Sevilla
Darío Álvarez Álvarez-Universidad de Valladolid
Antonio Ampliato Briones-Universidad de Sevilla
Joaquín Antuña-Universidad Politécnica de Madrid
Ángela Barrios Padura-Universidad de Sevilla
José María Cabeza Laínez-Universidad de Sevilla
Pilar Chías Navarro-Universidad de Alcalá
Juan Calatrava Escobar-Universidad de Granada
María Carrascal Pérez-Universidad de Sevilla
Helena Coch Roura-Universitat Politècnica de Catalunya
Jorge Cruz Pinto-Universidad de Lisboa
Carmen Díez Medina-Universidad de Zaragoza
Fernando Espuelas Cid-Universidad Europea
Alberto Ferlenga-Università IUAV di Venezia
Luz Fernández-Valderrama-Universidad de Sevilla
Vicente Flores Alés-Universidad de Sevilla
María del Carmen Galán Marín-Universidad de Sevilla
Jorge Filipe Ganhão da Cruz Pinto-Universidade de Lisboa
Carlos García Vázquez-Universidad de Sevilla
Sara Girón Borrero-Universidad de Sevilla
Francisco Gómez Díaz-Universidad de Sevilla
Amparo Graciani-Universidad de Sevilla
Francisco Granero Martín-Universidad de Sevilla
Francisco Hernández Olivares-Universidad P. de Madrid
Miguel Ángel de la Iglesia-Universidad de Valladolid
Paulo J.S. Cruz-Universidade do Minho
Francesc Sepulcre-Universitat Politècnica de Catalunya
Ángel Luis León Rodríguez-Universidad de Sevilla
Mercedes Linares Gómez del Pulgar-Universidad de Sevilla
María del Mar Loren Méndez-Universidad de Sevilla

Margarita de Luxán García de Diego-Universidad P. de Madrid
Madelyn Marrero-Universidad de Sevilla
Juan Jesús Martín del Río-Universidad de Sevilla
Luis Martínez-Santamaría-Universidad Politécnica de Madrid
Ángel Martínez García-Posada-Universidad de Sevilla
Mauro Marzo-Università IUAV di Venezia
Pilar Mercader Moyano-Universidad de Sevilla
Antonello Monaco-Università degli Studi di Reggio Calabria
Marta Molina Huelva-Universidad de Sevilla
José Morales Sánchez-Universidad de Sevilla
Eduardo Mosquera Adell-Universidad de Sevilla
María Teresa Muñoz Jiménez-Universidad Politécnica de Madrid
Jaime Navarro Casas-Universidad de Sevilla
José Joaquín Parra Bañón-Universidad de Sevilla
Víctor Pérez Escolano-Universidad de Sevilla
Francisco Pinto Puerto-Universidad de Sevilla
Mercedes Ponce Ortiz de Insagurbe-Universidad de Sevilla
Juan Luis de las Rivas Sanz-Universidad de Valladolid
Carmen Rodríguez Liñán-Universidad de Sevilla
Javier Ruiz Sánchez-Universidad Politécnica de Madrid
Joaquín Sabaté Bel-Universitat Politècnica de Catalunya
Victoriano Sáinz Gutiérrez-Universidad de Sevilla
Santiago Sánchez Beitia-Universidad del País Vasco
Domingo Sánchez Fuentes-Universidad de Sevilla
José Sánchez Sánchez-Universidad de Sevilla
Juan José Sendra Salas-Universidad de Sevilla
Julián Sobrino Simal-Universidad de Sevilla
Federico Soriano Peláez-Universidad Politécnica de Madrid
Rafael Suárez Medina-Universidad de Sevilla
Miguel Ángel Tabales Rodríguez-Universidad de Sevilla
Antonio Tejedor Cabrera-Universidad de Sevilla
Jorge Torres Cueco-Universidad Politécnica de Valencia
Elisa Valero Ramos-Universidad de Granada
Manuel Vázquez Boza-Universidad de Sevilla
Narciso Vázquez Carretero-Universidad de Sevilla
Teófilo Zamarreño García-Universidad de Sevilla

LT 3

PATRIMONIO Y
REHABILITACIÓN

HERITAGE AND REHABILITATION / PATRIMONIO Y REHABILITACIÓN

- p. 565-574: **NEW KNOWLEDGE ABOUT THE CHURCH OF SANTA MARÍA IN CARMONA** / p. 575-585: NOVEDADES EN TORNO A LA IGLESIA DE SANTA MARÍA DE CARMONA
Ojeda Barrera, Alfonso
- p. 587-596: **GEOMETRY AND CONSTRUCTION THROUGH THE SACRED SPACE OF ANDRÉS DE VANDELVIRA** / p. 597-607: GEOMETRÍA Y CONSTRUCCIÓN A TRAVÉS DEL ESPACIO SACRO DE ANDRÉS DE VANDELVIRA
Estepa Rubio, Antonio
- p. 609-619: **AN APPROACH TO THE IDEAL CONCEPT OF URBAN PLANNING IN THE 18TH CENTURY: COLONIAL SETTLEMENTS IN ANDALUSIA** / p. 620-630: APROXIMACIÓN AL URBANISMO IDEAL EN EL S. XVIII: LAS NUEVAS POBLACIONES DE COLONIZACIÓN EN ANDALUCÍA
Quevedo Rojas, Carlos
- p. 631-642: **POWER PLANT REUTILIZATION STRATEGIES ENEL POWER PLANTS AND PORT OF GENOA CASE-STUDY** / p. 643-655: ESTRATEGIAS DE REÚSO DE LAS CENTRALES ELÉCTRICAS. LAS CENTRALES ENEL Y EL CASO ESTUDIO DEL PUERTO DE GÉNOVA
Olivieri, Davide
- p. 657-664: **TECHNICAL-TECHNOLOGICAL AND MATERIALS COMPARATIVE ANALYSIS BETWEEN ITALIAN AND SPANISH MEDIEVAL SHIPYARD (THE CASE OF VENICE AND SEVILLE)** / p. 665-673: ANÁLISIS COMPARATIVO TÉCNICO-TECNOLÓGICO Y DE MATERIALES ENTRE LOS ASTILLEROS MEDIEVALES ITALIANOS Y ESPAÑOLES (LOS CASOS DE VENECIA Y SEVILLA)
Debenedictis, Domenico; Robador González, María Dolores; Pagliuca, Antonello
- p. 675-684: **STRATEGIES FOR CONSERVATION OF RELIGIOUS HERITAGE IN THE METROPOLITAN AREA OF LYON/SAINT-ÉTIENNE (FRANCE). SHORT RESEARCH STAY AND METHODOLOGICAL TRANSFER** / p. 685-695: ESTRATEGIAS PARA LA CONSERVACIÓN DEL PATRIMONIO ECLESIAÍSTICO EN LA METRÓPOLIS LYON/SAINT-ÉTIENNE (FRANCIA). LA ESTANCIA BREVE INVESTIGADORA COMO VÍA DE TRANSFERENCIA METODOLÓGICA
Mascort-Albea, Emilio J.; Meynier-Philip, Mélanie
- p. 697-709: **HYDRAULIC HERITAGE AND THE CONSTRUCTION OF THE TERRITORY: THE IRRIGATION COMMUNITIES** / p. 710-722: EL PATRIMONIO HIDRÁULICO EN LA CONSTRUCCIÓN DEL TERRITORIO: LAS HEREDADES
Delgado Quintana, Guacimara
- p. 723-731: **SUSTAINABILITY AND CONSERVATIVE REHABILITATION OF EXTREMADURAN PATRIMONIAL RURAL ARCHITECTURE AGAINST CLIMATE CHANGE. VEGAVIANA, CASE STUDY** / p. 732-741: SOSTENIBILIDAD Y REHABILITACIÓN CONSERVADORA DE LA ARQUITECTURA RURAL PATRIMONIAL EXTREMEÑA CONTRA EL CAMBIO CLIMÁTICO. VEGAVIANA, CASO DE ESTUDIO
Bote Alonso, Inmaculada
- p. 743-754: **TOWARDS A METHODOLOGY FOR THE ASSESSMENT OF VISUAL IMPACT CAUSED BY RENEWABLE ENERGY FACILITIES ON THE LANDSCAPE IN CULTURAL HERITAGE SITES** / p. 755-766: HACIA UNA METODOLOGÍA DE VALORACIÓN DEL IMPACTO VISUAL CAUSADO POR INSTALACIONES DE ENERGÍA RENOVABLE EN EL PAISAJE EN EL ENTORNO DE LUGARES PATRIMONIO CULTURAL
Diego Rodríguez, Jesús Carlos; Chías Navarro, Pilar
- p. 767-772: **THE URBAN RENOVATION IN PUEBLA, MEXICO. THE HISTORICAL CENTER AS EXPERIMENTAL SPACE. THIRTY YEARS OF CITY TRANSFORMATION** / p. 773-779: LA RENOVACIÓN URBANA EN PUEBLA, MÉXICO. EL CENTRO HISTÓRICO COMO ESPACIO EXPERIMENTAL. TREINTA AÑOS DE TRANSFORMACIÓN DE LA CIUDAD
Cortés Moreno, Jorge David
- p. 781-790: **THE ORNATE IN THE ARCHITECTURE OF TENERIFE AND GRAN CANARIA: 1865-1935** / p. 791-800: EL ORNATO EN LA ARQUITECTURA DE TENERIFE Y GRAN CANARIA: 1865-1935
Sabina González, José Antonio
- p. 801-807: **THE CONSERVATION OF THE CONSTRUCTIONS LOCATED ON PROTECTED NATURAL AREAS: RESEARCH EXPERIENCE IN DOÑANA** / p. 808-815: LA CONSERVACIÓN DE LO CONSTRUIDO EN LOS ESPACIOS NATURALES PROTEGIDOS: EXPERIENCIA DE INVESTIGACIÓN EN DOÑANA
Rincón Calderón, José María; Galán Marín, Carmen; Sanchez Fuentes, Domingo
- p. 817-827: **TRANSHUMANCE HERITAGE IN THE STRUCTURING OF THE LANDSCAPE, CITIES AND ARCHITECTURE** / p. 828-838: EL PATRIMONIO DE LA TRASHUMANCIA EN LA VERTEBRACIÓN DEL TERRITORIO, LA CIUDAD Y LA ARQUITECTURA
Gutiérrez Pérez, Nicolás
- p. 839-848: **INTERVENTION IN THE HERITAGE OF RURAL COLONIZATION ARCHITECTURE. THE VILLAGES OF LOS MONEGROS** / p. 849-859: INTERVENCIÓN EN EL PATRIMONIO DE LA ARQUITECTURA RURAL DE COLONIZACIÓN. LOS POBLADOS DE LA COMARCA DE LOS MONEGROS
Prieto Mochales, Luis
- p. 861-870: **MODERN ARCHITECTURE IN MANZANILLO, COLIMA, MEXICO 1930-1970 (TRANSFER AND ADAPTATION)** / p. 871-880: ARQUITECTURA MODERNA EN MANZANILLO, COLIMA, MÉXICO 1930-1970 (TRANSFERENCIA Y ADAPTACIÓN)
Yáñez Ventura, Marco Antonio; López García, J. Jesús
- p. 881-893: **FIRST INTERNATIONAL ARCHITECTURAL JOURNEY OF JUAN MADRAZO** / p. 894-906: PRIMER VIAJE INTERNACIONAL ARQUITECTÓNICO DE JUAN MADRAZO
Fernández Martínez, Margarita María
- p. 907-918: **HOUSES, COURTYARD TENEMENT HOUSING, INNS AND SHOPS IN 16TH SEVILLE. ARCHITECTURE, DRAWING AND GLOSSARY OF MASTER BUILDERS** / p. 919-930: CASAS, CORRALES, MESONES Y TIENDAS EN LA SEVILLA DEL SIGLO XVI. ARQUITECTURA, DIBUJO Y LÉXICO DE ALARIFES
Núñez González, María
- p. 931-939: **TOWARDS THE CONSTRUCTION OF ATLAS OF SURVIVING ARCHITECTURES** / p. 940-949: HACIA LA CONSTRUCCIÓN DEL ATLAS DE ARQUITECTURAS SUPERVIVIENTES
Tejera Mujica, Noemi
- p. 951-960: **TRANSFORMATIONS OF THE ALCÁZAR OF SEVILLE THROUGH ITS IMAGES (1902-1969)** / p. 961-971: TRANSFORMACIONES DEL REAL ALCÁZAR DE SEVILLA A TRAVES DE SUS IMÁGENES (1902-1969)
Bañasco Sánchez, Pablo
- p. 973-980: **THE ARCHITECTURE OF POWER. THE ISLAND INSTITUTIONS AND AUTONOMOUS BODIES. ANALYSIS OF THE CASES: GRAN CAÑARIA, TENERIFE AND MADEIRA** / p. 981-987: LA ARQUITECTURA DEL PODER. LAS INSTITUCIONES INSULARES Y ORGANISMOS AUTÓNOMOS. ANÁLISIS DE LOS CASOS: GRAN CANARIA, TENERIFE Y MADEIRA
Hernández Cruz, Ricardo Kevin
- p. 989-998: **PROPOSAL FOR AN INDICATORS SYSTEM OF URBAN INTEGRATION OF THE MARITIME PORTS HERITAGE** / p. 999-1009: PROPUESTA PARA UN SISTEMA DE INDICADORES DE INTEGRACIÓN URBANA DEL PATRIMONIO PORTUARIO MARÍTIMO
De las Peñas García, Jesús
- p. 1011-1020: **EMPIRICAL METHOD APPLIED IN RESEARCH ON RESIDENTIAL ENERGY RETROFITTING** / p. 1021-1031: MÉTODO EXPERIMENTAL EN LA INVESTIGACIÓN SOBRE REHABILITACIÓN ENERGÉTICA RESIDENCIAL
Escandón, Rocío; Blázquez, Teresa; Martínez-Hervás, Mónica; Suárez, Rafael; Sendra, Juan José
- p. 1033-1042: **AESTHETICS OF RUINS AND ETHICS OF ARCHITECTURAL DESIGN: NEW INTERVENTIONS ON ARCHAEOLOGICAL HERITAGE** / p. 1043-1053: ESTÉTICA DE LAS RUINAS Y ÉTICA DEL PROYECTO ARQUITECTÓNICO: NUEVAS INTERVENCIONES EN EL PATRIMONIO ARQUEOLÓGICO
Bagnato, Vincenzo Paolo

STRATEGIES FOR CONSERVATION OF RELIGIOUS HERITAGE IN THE METROPOLITAN AREA OF LYON/SAINT-ÉTIENNE (FRANCE). SHORT RESEARCH STAY AND METHODOLOGICAL TRANSFER.

Mascort-Albea, Emilio J. ⁽¹⁾; Meynier-Philip, Mélanie ⁽²⁾

(1) Universidad de Sevilla, Escuela Técnica Superior de Arquitectura, emascort@us.es

(2) Laboratoire E.V.S.- Lyon Architecture Urbanisme Recherche (LAURE), melanie.meynier@lyon.archi.fr

Abstract: This proposal aims to enhance the interest in short research stays as experiences that promote the internationalization of doctoral studies. This particular case involves a short research stay between April and July of 2016 at the Lyon National School of Architecture (ENSAL). During this period, the authors of this paper have complemented their respective doctoral research through a process of methodological transfer.

Studies of contextualization, cataloguing, and technical characterization were applied to the religious buildings located in Lyon/Saint-Etienne's metropolitan area. In this case study, the authors utilized geographical information technologies, collaborative inventories and open-data strategies.

As the final result of this process, an interactive map of the Good Shepherd's Church (Lyon, France) was published. This cartography was able to provide typological and historical information about the building's inner spaces and works of art. Furthermore, several geographical information services were generated and shared as an open dataset.

Keywords: Geographic Information Systems (GIS), UNESCO's World Heritage Sites, Architecture at risk, Interactive maps, Open Data.

1. Introduction

This work is the consequence of a short research stay carried out between April and July of 2016 at the Lyon National School of Architecture (ENSAL) by Emilio J. Mascort-Albea, from the Spanish TEP-018 (Ingeniería del Terreno) research group. During this period, members of the French group EVS-LAURE (Environnement Ville Société - Lyon Architecture Urbanisme Recherche) mentored the Spanish researcher.

A short project was established with the collaboration of Mélanie Philip-Meynier, a French researcher specialising in religious architecture. The two Ph. D. students were able to combine their respective work topics, thereby generating a methodological transfer. The main aim of this paper consists of a deep reflection regarding this process and the obtained results.

The Spanish Ph.D. student set up a new contact between two research groups which had never collaborated before. Preliminary discussions revealed that the researchers involved had several interests in common. An associative topic based on religious architecture analysis was therefore proposed, and a small research team was created with a doctoral student of each research group.

Once the work period began the first technical approaches were found to be too far apart and, at this point, each researcher had to specify their own aims. The major role taken by the supervisor of the stay, Dr François Fleury, enabled a satisfactory convergence to be established between the two researchers. After several public presentations and work meetings, the research methodologies focused on a useful common objective for each Ph. D. student. This final topic consisted of the analysis of the current state of churches located in Lyon/Saint-Etienne metropolitan area, which involved the use of geographic information technologies combined with collaborative inventories in order to propose new strategies for the preventive conservation of religious architecture at risk.

Finally, both researchers selected a new case study that was able to satisfy their respective research aims: the Good Shepherd's church, which is located within Lyon's UNESCO boundaries. Therefore, the tasks of contextualization, cataloguing and technical characterization of this temple enabled the methodological convergence of these two doctoral methodologies.

2. Methodologies

The two doctoral methodologies can be applied to common topics, such as preventive conservation of heritage buildings, GIS cataloguing, and architectural diagnosis. These methodologies are presented below.

2.1. Conversion strategies for religious architecture at risk.

Whilst the secularization phenomenon of western societies remains a highly analysed topic by Humanities and Social Sciences researchers, hardly any studies from an architectural perspective can be found. Its consequences are analysed by the doctoral project titled: "Between emotional value and practical value. What kind of future is there for the churches of Metropolis Lyon/Saint-Etienne?" ("Entre valeur affective et valeur d'usage, quel avenir pour les églises de la métropole Lyon Saint-Etienne?"). Additionally, the current work proposes new strategies for a correct spatial and functional conversion of the churches analysed. Architectural and historical analyses allow several transformation strategies, which combine the local town planning requirements with the refurbishment potential of these kinds of buildings.

The beginning of this Ph. D. project is the result of the French researcher's short stay at the Canada Research Chair on Urban Heritage from the University of Quebec (Chaire de recherche du Canada en patrimoine urbain de l'Université du Québec à Montréal, UQAM), whereby this Canadian methodology (Noppen et al. 2005) is applied to a French context. According to the French Religious Heritage Observatory (Observatoire du Patrimoine Religieux, OPR), between 5% and 10 % of the Catholic churches (from 5,000 to 10,000 buildings) will be sold, abandoned, or even demolished over the next two decades.

The case study is composed of a group of Lyon/Saint-Etienne metropolitan parish churches affected by the impending threat of demolition. Furthermore, a territorial and historical approach enables the detection of the various intervention policies developed at national, regional, and local levels. In this regard, we can find many particular circumstances in these churches, which depend on their chronology, their heritage protection level, and their demographic context.

2.2. Preventive conservation and geographic data on an architectural scale

Contemporary geographic information technologies offer several possibilities for managing and interpreting patrimonial knowledge (Giannopoulou et al. 2014). These reflections are developed in the Ph. D. thesis project titled "Maps for Architectural Heritage. Technical Characterization of Seville's medieval churches with geographic information systems" ("Mapas para el Patrimonio. Caracterización técnica de las iglesias medievales de Sevilla mediante sistemas de información geográfica"). An in-depth study of this topic has detected a void of geographic information related to architectural inner spaces.

As this work aims to demonstrate, GIS tools can be used to enhance the preventive conservation of historical buildings. Moreover, computer applications related to Cultural Heritage can be developed with this class of technology (Mascort-Albea et al. 2016; Mascort-Albea 2017). This research project works with the architectural scale as its main range to design interactive maps using GIS tools. Thanks to the experience acquired whilst working on the doctoral case study, a detailed protocol is to be published. This document will explain the whole process that enables the publication of architectural interactive maps using CAD and GIS software.

3. Case study approach

3.1. Current state of temples located in Lyon/Saint-Etienne metropolitan area

With the creation of an inventory of the endangered churches located in Lyon/Saint-Etienne metropolitan area, different strategic axes can be proposed for future conversion processes. A complete list of the case study elements systematizes the various intervention models which can be found. Therefore, this document will be helpful for church owners, town halls, dioceses, and the rest of the agents involved.

This work is conceived as a resource able to anticipate the progressive destruction process that the churches under threat will experience. In this way, this inventory could prevent those temples at risk from becoming victims of urban speculation and financial processes. Not only are preventive conservation actions proposed, but also long-lasting integration into the urban and suburban landscape.

The Lyon/Saint-Etienne metropolitan area churches inventory has been geographically referenced thanks to the collaboration of the EVS-ISIG researcher group, and especially with the help of Dr. Hélène Mathian. This catalogue provides information on a total amount of 393 churches. The obtained results can be reduced to nine demolished churches, four temples adapted to non-Christian religious cults, three mixed-use buildings, 14 converted constructions, and finally, 15 closed or abandoned churches (Fig. 1).

Within all the case study buildings, special attention has been paid to closed churches. In spite of their patrimonial values, the survival of these kinds of temples is at risk due to the lack of financial and human resources. Nowadays, it is the acknowledgement of their heritage which can usually save these buildings from demolition.

In this sense, new information and communication technologies offer new ways to spread the patrimonial value of these types of constructions and to make it more comprehensible. The utilisation of GIS in the development of interactive applications enhances the importance of these churches' historical roots and the quality of the places where they are located.

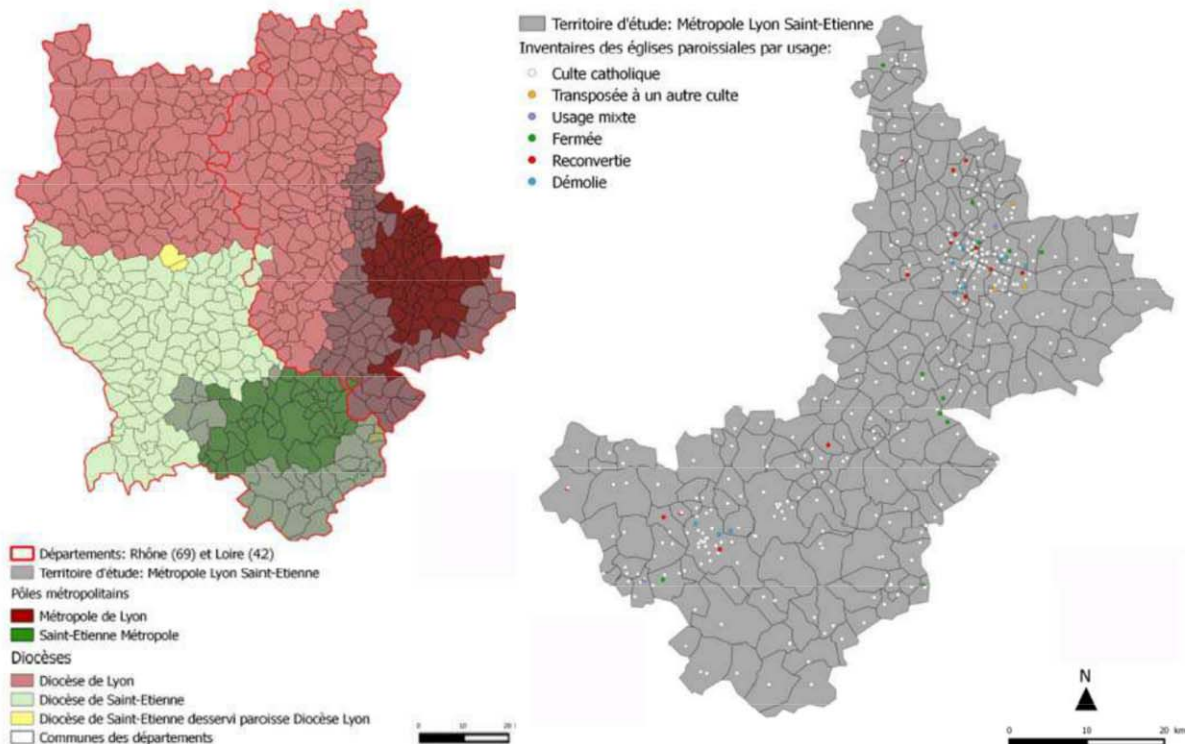


Fig. 1 Maps showing the inventory of the Lyon/Saint-Etienne's parish churches. Source: Mélanie Meynier-Philip (2016)

In conclusion, new strategies are required in order to make citizens, professionals and institutions aware of the importance of the churches under threat in the Lyon/Saint-Etienne metropolitan area. The sharing and spreading of information regarding endangered temples could provide one of these lines of work.

3.1.1. *The church of the Good Shepherd (Lyon, France)*

Once the most interesting case studies for the French researcher had been identified, a definitive selection was established in accordance with the aims of the Spanish researcher. One of the requirements was that the selected building had to be located in Lyon. This city has a metropolitan configuration, contains a historical centre designated as a UNESCO World Heritage site, and offers a very specific cityscape.

The preliminary selection developed by the Spanish Ph. D. student included some of the most important parish churches of the Lyon's historical centre. We are referring to the churches of Saint-Bonaventure, Saint-Nizier, Saint-Georges, Saint Paul, Saint-Polycarpe and Saint-Bruno. Nevertheless, a direct comparative study with the medieval temples of Seville was impossible since no church with similar characteristics could be found in Lyon. According to the mentioned reasons, it was agreed that the church of the Good Shepherd (église du Bon Pasteur) would become the case study of the planned project (Fig 2).

The church of the Good Shepherd is a neo-medieval temple built during the nineteenth century in one of the proletarian neighbourhoods of Lyon, known as les Pentes de la Croix-Rousse. This church is not considered a national French monument, but it does feature in the heritage inventory of the Auvergne-Rhone-Alpes region.

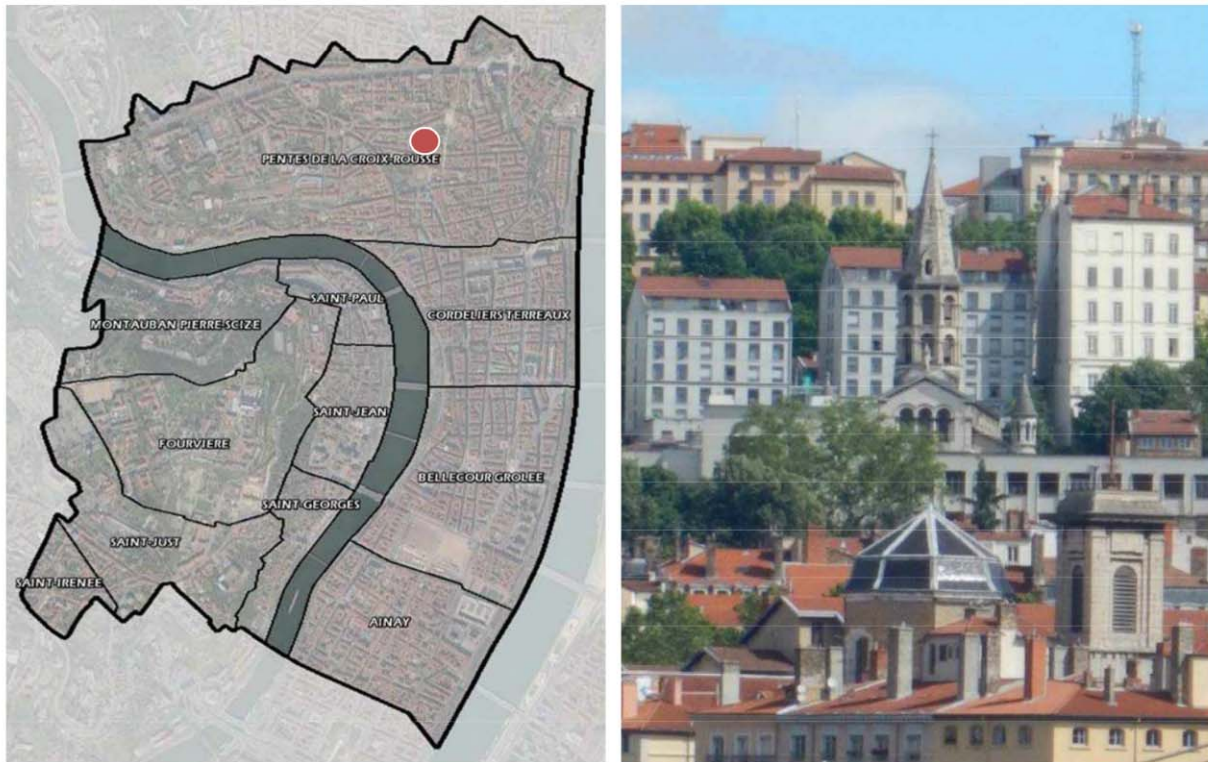


Fig.2 Good Shepherd's church located in the UNESCO perimeter of Lyon. Building's detailed view.

Although the building was promoted and supported by the emperor Napoleon III, the original project of the church was never properly concluded due to uprisings occurring at the end of the nineteenth century.

One of the singularities of the church of the Good Shepherd consists of the lack of a central staircase which connects the entrance of the main façade to street level. Furthermore, a sloped garden in front of this façade was previewed but never developed due to problems with the administration of the III French Republic (Mury 1906). Moreover, in the 1960's, a new Art School was built in front of the church, thereby blocking its former privileged presence in the cityscape of Lyon.

Nowadays the church of the Good Shepherd is located in a narrow traffic-filled street. Furthermore, the building has been closed to the public since 1987 (Association PAVE 2011) and the parish is managed from Saint Polycarp's church (église de Saint-Polycarpe). The inner spaces of the church of the Good Shepherd are currently in a clearly abandoned state (Fig. 3).

The neighbourhood of the Pentes de la Croix Rousse holds the greatest concentration of closed churches within the city. Very close to the selected case study, Saint Bernard's church (église de Saint-Bernard) can be found, which has also remained closed since 1999. This building suffered several incidences of damage following the construction of the Croix-Rousse tunnel. Finally, the nearby church of Saint Bernard (église de Saint-Bernard) lost its religious function in 2008.



Fig.3 Interior picture showing the present abandoned state of the church. Source: Mélanie Meynier-Philip and Emilio J. Mascort-Albea (2016).

4. Developed tasks

The scope of institutional geodatabases is usually vast, but its degree of detail fails to reach the inner spaces of the buildings. With the aforementioned methodology, this proposal promotes specific initiatives that are able to fill this gap. For this reason, the study of the collected information has provided interesting reflections regarding the design of geographical data models applied to architectural heritage.

The technical characterization of the church of the Good Shepherd implied a set of tasks developed from a multidisciplinary perspective. Therefore, the main work focused on: the analysis of documents by visits to the archives; the study of geographic platforms related to the metropolis Lyon/Saint-Étienne; the survey of the building; the creation of an architectural database; and the design of new layers of geographic information.

4.1. Documents

Several visits to different archives were undertaken with the aim of obtaining better historical knowledge of the church of the Good Shepherd. The most significant documents were found in the Rhône Departmental Archives (Service d'archives du département du Rhône et de la métropole de Lyon) and in the Archives of the Lyon General Society of Architects (Société Académique d'Architecture de Lyon).

As a result of this work, the original plans of the building were detected and scanned (Fig. 4). Moreover, these visits have been complemented with the consultation of ancient press reports and a variety of websites.



Fig. 4 Scanned images originating from the archives visited during the short research stay. Source: Rhône Departmental Archives.

4.2. In-situ inspections

In order to verify the state of the conservation of the material of the temple and to increase the level of knowledge regarding the building, diverse inspections were undertaken during April, May, and July of 2016. Since special permission is currently required to visit the church of the Good Shepherd, the majority of this work was carried out as external surveys.

The aforementioned inspections confirm that the building currently suffers no major constructive or structural damage although its inner spaces and furniture show a very high level of degradation. Many original works of art have disappeared and the wall surfaces are much deteriorated.

4.3. Architectonic database

The importance of correct organization related to digital data has increased in recent years. Appropriate normalization criteria are required for the development of an architectural database that describes the main features of the church, whereby any class of graphical and audio-visual information can be linked to a GIS Cloud Map: photographs, videos, historical plans, recordings, etc.

To this end, UML Diagrams constitute very useful tools to enable the correct normalization of future information models (Date 2003). Furthermore, the data size and the characteristics of the computer server that present the interactive maps must be controlled.

4.4. Surveys

Despite the contacts established with not only the head of the parish, but also with several local institutions, no digital information about the temple could be obtained. The researchers have therefore drawn a detailed plan of the church. To this end, they consulted digital maps, cadastral information, cartographies, and historical orthoimages of the city of Lyon (Fig. 5).

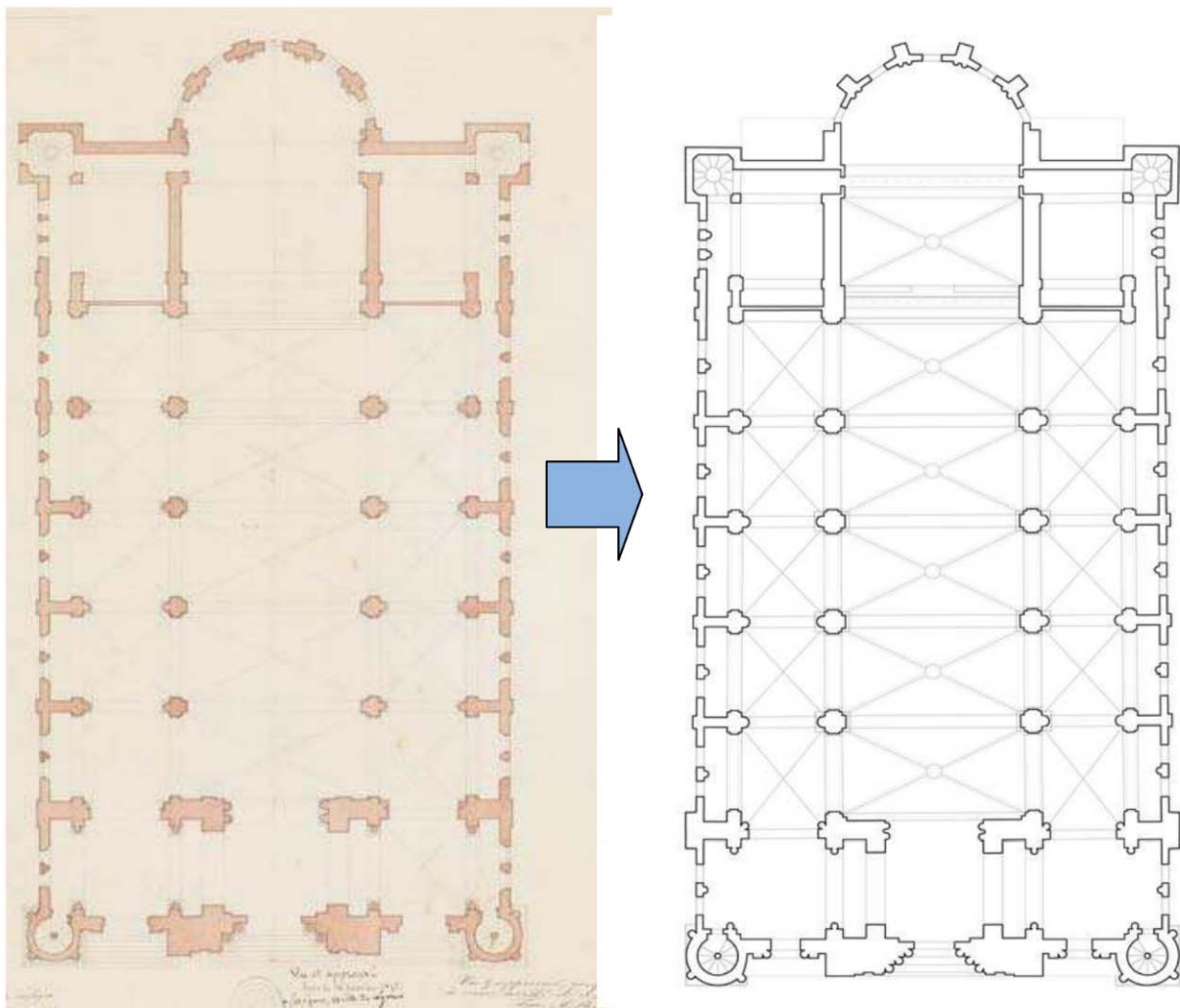


Fig. 5 Comparative analysis between the original plan of the building and the maps drawn during the stay.
Sources: Archives of Lyon General Society of Architects; Mélanie Meynier-Philip and Emilio J. Mascort-Albea (2016)

4.5 Geographic layers

Two different types of new geographic layers have been outlined: on the one hand, base layers fill the aforementioned gap in the data related to the architectural inner spaces; and on the other hand, operational layers offer the information related to the architectural database. These new layers provide information both about the main inner areas of the church, and about its movable assets.

Once the corresponding cartographic base was drawn, a group of operational layers were designed. These operational layers contain the information referring to the church of the Good Shepherd. For their creation, a set of geometrical entities has been drawn. These elements are polygons that determine the most representative inner areas of the building (Fig. 6). The operational layers of the church were linked to the architectural database by using GIS, whereby the layers were labelled with a code which enabled this process.

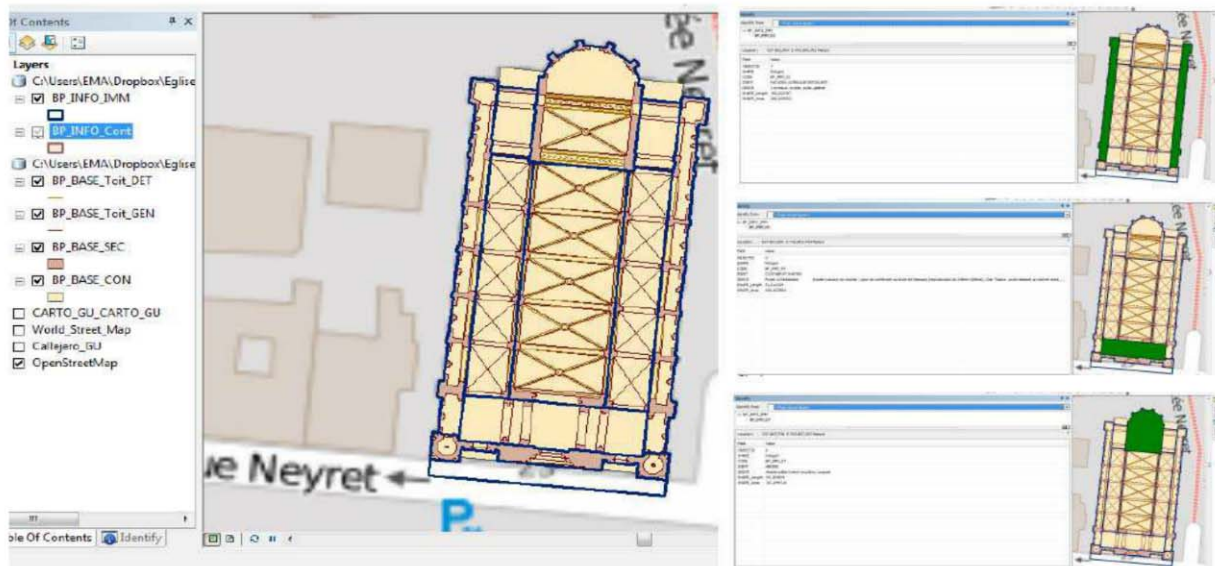


Fig 6 Operational layers related to the church of the Good Shepherd (Lyon, France). Source: Emilio J. Mascort-Albea and Mélanie Meynier-Philip (2016).

5. Results: open data vs closed churches

This project has contributed towards making the problem concerning the case study more visible and has provided a reflection on the utility of geographic data applied on an architectural scale (Meynier-Philip et al. 2016; Blomac 2017). The final results therefore consist of a group of geographic services that have been shared as open data. These services have been incorporated into an interactive map which enhances the patrimonial value of the church of the Good Shepherd.

5.1. Geographic information systems related to heritage architecture in Lyon

By reason of the proposal, the principal characteristics of the French spatial data infrastructures (Infrastructures de Données Géographiques, IDG) have been analysed (Noucher 2013).

Furthermore, several geographic platforms have been consulted during the cataloguing process. Nationally, the French Heritage Atlas¹ can be highlighted, which, as in many other cases, fails to present the inner spaces of the buildings. A better knowledge of French cultural assets can be achieved by using this geographical database. Regionally, maps of the Rhone Hydrologic Observatory² have additionally been consulted. This geographic system shows the main features of the most important soil classifications from the metropolitan territory of Lyon/Saint-Etienne.

At urban level, the researchers have consulted many different types of data from the Metropolitan Information System of Lyon³, which is published in a multidisciplinary way. Moreover, the base maps of the project have employed open-data sources (Fig.7).

¹ Atlas des patrimoines de France: http://atlas.patrimoines.culture.fr/atlas/trunk/?ap_ter=FXX

² Observatoire des Sediments du Rhône: <http://www.graie.org/osr/spip.php?rubrique10>

³ Plan interactif Lyon: <http://cartes.lyon.fr/plan/>; Grand Data Lyon: <http://data.grandlyon.com/>



Fig. 7 Open base maps employed for uploading the operational layers of the building analysed. Sources: Open Street Maps (2016); World Street Maps (2016).

Finally, the geographic information published by the researchers of the EVS group has been managed during this research stay. This task has been possible thanks to the collaboration of M. Hervé Parmentier, a scientific cartographer from the École Normale Supérieure de Lyon (ENS). The data produced from the various EVS departments can be published on a geographic platform titled ELVIS⁴. A more in-depth study concerning the ELVIS platform detected that there is no specifically architectural information published on this system. This reveals a potentially interesting field of investigation for the researchers of the Lyon National School of Architecture (ENSAL). If the geographical data related to the church of the Good Shepherd were published on ELVIS, a new topic would open on the platform. In this way, GIS techniques would approach those of specific architectural investigations.

5.2. An interactive map for the conservation of the church of the Good Shepherd

In this research, cartography functions as the beginning and end of a complete process. Maps are not only a source of information, but also the repository that manages information data regarding the building. It is therefore considered very interesting for this methodological transfer to be applied in public and in ancient buildings, which have been continually transformed with the passing of time. The provisional publication of an interactive map regarding the church of the Good Shepherd is shown below. These results are consequence of the tasks of surveying, cataloguing, and diagnosis explained in Chapter 4 of this document. All the information obtained is represented in the conservation map of the analysed elements (Fig. 8).

New architectural geo-referenced information can be shared by open-data platforms. With these kinds of strategies, collective knowledge of heritage architecture can be generated. Hence, the integration of architectonic data of historic buildings held on different urban and territorial information systems facilitates the tasks of managing and planning on various scales (Las Casas et al. 2014).

⁴ EVS-ELVIS: <http://elvis.ens-lyon.fr/geonetwork/srv/spa/catalog.search#/home>



Fig. 8 Selected web templates for the publication of interactive maps regarding the church of the Good Shepherd (Lyon, France). Source: Emilio J. Mascort-Albea and Mélanie Meynier-Philip (2016)

6. Conclusions

In a general way, this investigation has revealed the capability of international research stays for the improvement of doctoral projects. For a limited period of time, two widely varying proposals were able to converge on a common line of research. As a result of this experience, a transference of topics and methodologies was achieved.

More specifically, reflection is proposed on the significant number of churches at risk that can be found in Occidental societies. These buildings require actions and strategies capable of halting the advance of these dangerous circumstances. Moreover, ICT is proposed as a useful resource to report the existence of cultural assets at risk.

The results obtained provide alternative methods for surveying historical buildings in an agile way when resources, such as 3D scanners and digital photogrammetric cameras, are unavailable, and/or in the cases where the creation of 3D models becomes an unacceptably slow and laborious task. With this methodological proposal, the main elements of historic architecture can be registered and shared. Future work along this line of research would increase the degree of detail enjoyed by the current geographic viewers.

Finally, this research stay demonstrates that the Spanish Ph. D. student's methodology is applicable in other European case studies. The use of open-data maps provides an interesting means for the publication and sharing of the results obtained. Institutional support of these projects remains

necessary, however, in order to enable the technological development of computer applications that facilitate their transference.

7. References

Association PAVE (2011) L'église du Bon Pasteur. L'enfant abandonné

Blomac F (2017) Montrer les données urbaines: aller plus loin mais? DécryptaGéo 14-15

Date C.J. (2003). An introduction to Database Systems 8th ed., Boston. Addison-Wesley.

Las Casas G et al (2014) Open data for territorial specialization assessment. TEMA Journal (Special Issue):581-595. doi: <http://dx.doi.org/10.6092/1970-9870/2557>

Giannopoulou M et al (2014) Using GIS to record and analyse historical urban areas. TEMA Journal (Special Issue): 487-497. doi: <http://dx.doi.org/10.6092/1970-9870/2525>

Mascort-Albea, E.J. (2017). Datos geográficos abiertos para la conservación preventiva del patrimonio arquitectónico. Revista PH, (92). <http://www.iaph.es/revistaph/index.php/revistaph/article/view/3948#.WbFH1bJJbIU>

Mascort-Albea EJ, Ruiz-Jaramillo J et al (2016) Sevilla, Patrimonio Mundial: guía cultural interactiva para dispositivos móviles. Revista PH 90: 152-168. <http://www.iaph.es/revistaph/index.php/revistaph/article/view/3778#.WVpHfYTyjIU>

Meynier-Philip M, Mascort-Albea EJ, Ruiz-Jaramillo J (2016) Eglises fermées Vs Données ouvertes. Outils pour la diffusion du patrimoine: L'exemple de l'église du Bon Pasteur. En Les données urbaines, quelles pratiques et quels savoirs ? Lyon, France: Université Lyon 2

Mury J (1906) Une paroisse lyonnaise pendant 50 ans: Le Bon-Pasteur. Crozier, Lyon

Noppen, L. et al (2005). La conversion des églises au Québec, un siècle d'expérience(s). ARQ NO. 131, Montreal, Canada: Chaire de recherche du Canada en patrimoine urbain.

Noucher M (2013) Infrastructures de données géographiques et flux d'information environnementale. Netcom, 27(1/2):120-147. doi: 10.4000/netcom.1404

Acknowledgements: The *V Plan Propio de Investigación de la Universidad de Sevilla* has provided the funds that supported the short research project developed in Lyon and the writing of this paper. Furthermore, it's necessary to thank the extraordinary attention that the Spanish researcher has received from the staff of the Lyon National School of Architecture, in particular from the members of EVS-LAURE and MAP-ARIA.